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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/722,484	11/28/2003	Fumio Yuuki	520.43305X00	9982

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EXAMINER

WILLIAMS, LAWRENCE B

ART UNIT	PAPER NUMBER
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2611

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	04/04/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary

Application No.

10/722,484

Applicant(s)

YUUKI ET AL.

Examiner

Lawrence B. Williams

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 28 November 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-13 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 1 is/are allowed.
- 6) ☒ Claim(s) 3, 5 and 8-13 is/are rejected.
- 7) ☒ Claim(s) 2, 4-7 and 10 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 28 November 2003 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____

DETAILED ACTION

Drawings

1. Figures 17-24 should be designated by a legend such as --Prior Art-- because only that which is old is illustrated. See MPEP § 608.02(g). Corrected drawings in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. The replacement sheet(s) should be labeled "Replacement Sheet" in the page header (as per 37 CFR 1.84(c)) so as not to obstruct any portion of the drawing figures. If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Specification

2. The disclosure is objected to because of the following informalities:
- a.) The examiner suggests applicant replace the word "sigle" with "single" in line 15 of page 6.
 - b.) The phrase "the eye serving as the eye" is unclear in lines 13-14 of page 8.
- Appropriate correction is required.

3. The specification has not been checked to the extent necessary to determine the presence of all possible minor errors. Applicant's cooperation is requested in correcting any errors of which applicant may become aware in the specification.

Claim Objections

4. Claims 2, 5, 7, 10 are objected to because of the following informalities: The examiner suggests applicant define the variable "N".

Appropriate correction is required.

5. Claim 7 is objected to because of the following informalities: The examiner suggests, "comprises" instead of "comprising".

Appropriate correction is required.

Claim Rejections - 35 USC § 112

6. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter, which the applicant regards as his invention.

7. Claim 8 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claim 8 recites the limitation "said N selector control signals" in line 2. There is insufficient antecedent basis for this limitation in the claim.

8. Claims 9-10 are rejected as failing to define the invention in the manner required by 35 U.S.C. 112, second paragraph.

Claim 9 is narrative in form and replete with functional or operational language. The structure which goes to make up the device must be clearly and positively specified. The structure must be organized and correlated in such a manner as to present a complete operative

device. The claim(s) must be in one sentence form only. Note the format of the claims in the patent(s) cited.

Claim 10 is rejected as well based upon its dependency upon rejected claim 9.

9. Claims 11-13 are rejected as failing to define the invention in the manner required by 35 U.S.C. 112, second paragraph.

Claim 11 is narrative in form and replete with functional or operational language. The structure which goes to make up the device must be clearly and positively specified. The structure must be organized and correlated in such a manner as to present a complete operative device. The claim(s) must be in one sentence form only. Note the format of the claims in the patent(s) cited.

Claims 12-13 are rejected as well based upon their dependency upon rejected claim 11.

10. Claim 10 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. The phrase "over a long period of time" renders the claim(s) indefinite because it is not clear as what period of time is included or not included by the limitation, thereby rendering the scope of the claim(s) unascertainable. See MPEP § 2173.05(d).

Claim Rejections - 35 USC § 102

11. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

12. Claim 3 is rejected under 35 U.S.C. 102(b) as being anticipated by Applicant's Admitted Prior Art.

Applicant's Admitted Prior art discloses in Fig. 19, a digital-control type clock data recovery circuit comprising: a phase comparator (1903) for comparing a phase of input data (1901) with a phase of a data recovery clock signal generated internally and outputting shift directions of said phase of said data recovery clock signal as UP and DOWN signals (Fig. 19, 1904; page 4, lines 2-7); a counter (1905) for controlling a frequency at which said UP and DOWN signals are fed back to a means for determining said phase of said data recovery clock signal (page 4, lines 7-9); a cyclic clock-phase pointer (1907) for generating a phase control signal ($\theta_1, \phi_1; \theta_2, \phi_2$, control signals for controlling current in phase interpolation circuit) for controlling said determined phase of said data recovery clock signal on the basis of OUT UP and OUT DOWN signals output by said counter (pg. 4, lines 9-14); and a phase variable-delay circuit (1908, Fig. 4 discloses; analog control (adjusting phase delay by changing current) for outputting a clock signal (1902; CK0, CK90) according to said phase control signal as said data recovery clock signal; wherein said input data is taken in with a timing of said data recovery clock signal (Applicant's admitted Prior Art discloses the configuration of Fig. 19, as a variable delay type phase generator adopted in a CDR circuit (page 3, line 22) and "input data taken in with a timing of a data recovery signal" would be an inherent feature).

13. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

14. Claims 9 and 11 are rejected under 35 U.S.C. 102(a) as being anticipated by Dally et al. (US 2003/0086339 A1).

(1) Regarding claim 9, Dally et al. discloses in Fig. 12, a digital-control type clock data recovery circuit having a function to track a wander (pg. 1, paragraphs 0014-0017) of input data by comparing a position of an edge of said input data with a position of an edge of a clock signal (pg. 3, paragraph [0018]).

(2) Regarding claim 11, Dally et al. also discloses in Fig. 12, a digital-control type clock data recovery circuit having a control circuit (22, 24, 26 pg. 2 paragraphs [0018], pg. 4; paragraph [0069]) for comparing a position of an edge of data with a position of an edge of a data recovery clock signal (pg. 2 paragraph [0018]) to execute control for placing said edge of said data recovery clock signal in an eye narrowed by high-frequency phase deviations (jitters) of said data, wherein said data is taken in with a timing of said edge of said data recovery clock signal (pg. 4, paragraphs [0062-0063]).

Claim Rejections - 35 USC § 103

15. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are

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such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

16. Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Dally et al. (US 2003/0086339 A1) as applied to claim 3 above, and further in view of Lee et al. (US 2002/0085656 A1).

As noted above, Dally et al. discloses all limitations of claim 3 above. Dally et al. does not teach wherein the phase variable-delay circuit divides a reference clock signal into N portions to generate N clock signals with phases different from each other, and selects one of said N clock signals as said recovered clock signal in accordance with said phase control signal.

However, Lee et al. discloses in Fig(s) 4, 8, 9 data recovery using tracking eye tracking, wherein he teaches a phase variable-delay circuit divides a reference clock signal into N portions to generate N clock signals with phases different from each other (pg. 3, paragraph 0030]), and selects one of said N clock signals as said recovered clock signal in accordance with said phase control signal (pg. 4, paragraph [0037]).

It would have been obvious to one skilled in the art at the time of invention to incorporate the teachings of Lee et al. as a method of accurate phase tracking in a digital data link (pg. 1, paragraph [0010]).

Allowable Subject Matter

17. Claim 1 is allowed.

18. Claims 2, 7 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims and if rewritten to overcome the claim objections cited above.

19. Claims 4, 6 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

20. Claims 8, 10, 12-13 would be allowable if rewritten to overcome the rejection(s) under 35 U.S.C. 112, 2nd paragraph, set forth in this Office action and to include all of the limitations of the base claim and any intervening claims.

21. The following is a statement of reasons for the indication of allowable subject matter:
The instant application discloses a digital-control type clock data recovery circuit. A search of prior art has failed to teach or suggest, alone or in combination:

“a digital-control type clock data recovery circuit according to claim 3, wherein said phase variable-delay circuit changes said phase of said data recovery clock signal so as to separate said edge of said recovered clock signal away from said edge of said input data by a predetermined time gap” as disclosed in claim 4.

“phase variable-delay circuit selects one phase to be output by said phase variable-delay circuit on the basis of a plurality of results of phase detection carried out over a plurality of

cycles having a phase-switching pitch T_p equal to or smaller than a value determined by said cyclic clock-phase pointer” as disclosed in claim 6.

”a digital-control type clock data recovery circuit according to claim 3, wherein said phase variable-delay circuit comprises a buffer, a composition circuit, an N-1 selector and a CMOS level conversion circuit, and said buffer, said composition circuit, said N-1 selector and said CMOS level conversion circuit are each designed as a small-amplitude differential circuit” as disclosed in claim 7.

“a digital-control type clock data recovery circuit according to claim 9, wherein said function to track a wander of input data by comparing a position of an edge of said input data with a position of an edge of a clock signal is executed under a condition expressed by a relation given as follows: $B \times \sin(2\pi \times T_a/T_w) < T/N$ where symbol B denotes a maximum phase change of said input data over a long period of time, symbol T_a denotes a loop delay, which is a period of time between an output operation carried out by a counter and a first phase comparison, symbol T_w denotes a phase deviation period, symbol T denotes a clock period, symbol N denotes the number of phase divisions, and T/N denotes a difference between 2 adjacent phases determined by said number of phase divisions N” as disclosed in claim 10.

“a digital-control type clock data recovery circuit according to claim 11, wherein said control circuit executes said control for placing said edge of said data recovery clock signal in an eye narrowed by high-frequency phase deviations (jitters) of said data by execution of control to prevent a distance between said position of said edge of said data recovery clock signal and said position of said edge of said data from becoming smaller than a predetermined value” as disclosed in claim 12.

“a digital-control type clock data recovery circuit according to claim 11, wherein said control circuit compares said position of said edge of said data recovery clock signal with said position of said edge of said data at a first predetermined frequency and changes a phase of said data recovery clock signal at a second predetermined frequency not exceeding said first predetermined frequency” as disclosed in claim 13.

Conclusion

22. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

a.) Kono discloses in US 2004/0052152 A1 Semiconductor Memory Device With Clock Generating Circuit.

b.) Guo discloses in US Patent 5,400,370 All Digital High-Speed Algorithmic Data Recovery Method And Apparatus Using Locally Generated Compensated Broad Band Time Rulers And Data Edge Position Averaging.

c.) Guo discloses in US Patent 5,451,894 Digital Full Range Rotating Phase Shifter.

d.) Gu discloses in US Patent 6,901,126 B1 Time Division Multiplex Data Recovery System Using Close Loop Phase And Delay Locked Loop.

e.) Myers et al. discloses in US Patent 6,854,163 B1 Shared Data and Recovery For Packetized Data.

f.) Wang et al. discloses in US Patent 7,020,227 B1 Method And Apparatus For High-Speed Clock Data Recovery Using Low-Speed Circuits.

g.) Williams discloses in US Patent 5,592,125 Modified Bang-Bang Phase Detector With Ternary Output.

h.) Miki et al. discloses IEEE Journal of Solid-State Circuits A 50-mW/ch 2.5-Gb/s/ch Data Recovery Circuit for the SFI-5 Interface With Digital Eye-Tracking.

i.) Saito discloses in digest of Technical Papers A 50-mW/ch 2.5-Gb/s/ch Data Recovery Circuit for the SFI-5 Interface Using Novel Eye-Tracking Method.

23. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Lawrence B Williams whose telephone number is 571-272-3037. The examiner can normally be reached on Monday-Friday (8:00-6:00).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Ghayour Mohammad can be reached on 571-272-3021. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Lawrence B. Williams

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lbw

March 29, 2007



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SUPERVISORY PATENT EXAMINER